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**Population Ecology: Analysis Questions**

Ms. Ottolini, AP Biology, 2012-2013

1. Which of these individuals is *most* likely to be successful in an evolutionary sense?

A. a reproductively sterile individual who never falls ill

B. An individual who dies after 5 days of life but leaves 10 offspring, all of whom survive to reproduce

C. a male who mates with 20 females and fathers 1 offspring

D. An individual who lives 100 years and leaves 2 offspring,

2. Which of the examples below provides appropriate abiotic *and* biotic factors that might determine the distribution of the species in question?

A) the amount of nitrate and phosphate in the soil, and wildflower abundance and diversity

B) the number of frost-free days, and competition between species of introduced grasses and native alpine grasses

C) increased predation and decreased food availability, and a prairie dog population after a prairie fire

D) available sunlight and increased salinity in the top few meters of the ocean, and the abundance and diversity of phytoplankton communities

3. A biologist reported that a sample of ocean water had 5 million diatoms of the species *Coscinodiscus centralis* per cubic meter. What was the biologist measuring?

A. density B. dispersion C. carrying capacity D. range

4. To measure the population density of monarch butterflies occupying a particular park, 100 butterflies are captured, marked with a small dot on a wing, and then released. The next day, another 100 butterflies are captured, including the recapture of 20 marked butterflies. One would correctly estimate the population to be

A. 200. B. 500. C. 1,000. D. 10,000. E. 900,000.

5. Uniform spacing patterns in plants such as the creosote bush are most often associated with which of the following?

A. chance

B. patterns of high humidity

C. the random distribution of seeds

D. antagonistic interactions among individuals in the population

E. the concentration of resources within the population's range

6. Which of the following would be most likely to exhibit uniform dispersion?

A. red squirrels, which hide food and actively defend territories

B. cattails, which grow primarily at edges of lakes and streams

C. dwarf mistletoes, which parasitize particular species of forest trees

D. tassel-eared squirrels, which are nonterritorial

E. lake trout, which seek out deep water

*Use the survivorship curves in Figure 52.1 to answer the following questions (7-8).*

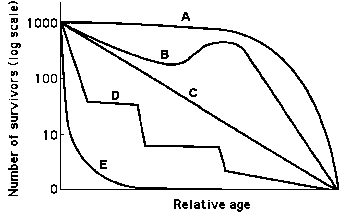


Figure 52.1

7. Which curve best describes survivorship in a marine crustacean that molts?

8. Which curve best describes survivorship in humans who live in developed nations?

10. A population of ground squirrels has an annual per capita birth rate of 0.06 and an annual per capita death rate of 0.02. Estimate the number of individuals added to (or lost from) a population of 1,000 individuals in one year.

A. 120 individuals added

B. 40 individuals added

C. 20 individuals added

D. 400 individuals added

E. 20 individuals lost

11. As *N* approaches *K* for a certain population, which of the following is predicted by the logistic equation?

A. The growth rate will not change.

B. The growth rate will approach zero.

C. The population will increase exponentially.

D. The carrying capacity of the environment will increase.

12. Which of the following characterizes relatively *K*-selected populations?

A. offspring with good chances of survival

B. many offspring per reproductive episode

C. small offspring

D. a high intrinsic rate of increase

13. Long-term studies of Belding's ground squirrels show that immigrants move nearly 2 km from where they are born and become 1%-8% of the males and 0.7%-6% of the females in other populations. On an evolutionary scale, why is this significant?

A. These immigrants make up for the deaths of individuals, keeping the other populations' size stable.

B. Young reproductive males tend to stay in their home population and are not driven out by other territorial males.

C. These immigrants provide a source of genetic diversity for the other populations.

D. Those individuals that emigrate to these new populations are looking for less crowded conditions with more resources.

E. Gradually, the populations of ground squirrels will move from a clumped to a uniform population pattern of dispersion.

14. Which of the following assumptions have to be made regarding the capture-recapture estimate of population size?

I. Marked and unmarked individuals have the same probability of being trapped.

II. The marked individuals have thoroughly mixed with the population after being marked.

III. No individuals have entered or left the population by immigration or emigration, and no individuals have been added by birth or eliminated by death during the course of the estimate.

A. I only

B. II only

C. I and II only

D. II and III only

E. I, II, and III

15. Which of the following scenarios would provide the most legitimate data on population density?

A. Count the number of nests of a particular species of songbird and multiply this by a factor that extrapolates these data to actual animals.

B. Count the number of pine trees in several randomly selected 10 m x 10 m plots and extrapolate this number to the fraction of the study area these plots represent.

C. Use the mark-and-recapture method to estimate the size of the population.

D. Calculate the difference between all of the immigrants and emigrants to see if the population is growing or shrinking.

E. Add the number of births and subtract the individuals that die to see if the population's density is increasing or decreasing.

16. Starting from a single individual, what is the size of a population of bacteria that reproduce by binary fission every 20 minutes at the end of a 2-hour time period? (Assume unlimited resources and no mortality.)

A. 18

B. 64

C. 128

D. 256

17. In July 2008, the United States had a population of approximately 302,000,000 people. How many Americans were there in July 2009, if the estimated 2008 growth rate was 0.88%?

1. 2,700,000
2. 5,500,000
3. 303,000,000
4. 304,000,000
5. 2,710,800,000

18. Which of the following causes populations to shift most quickly from an exponential to a logistic population growth?

1. increased birth rate
2. removal of predators
3. decreased death rate
4. competition for resources
5. favorable climatic conditions

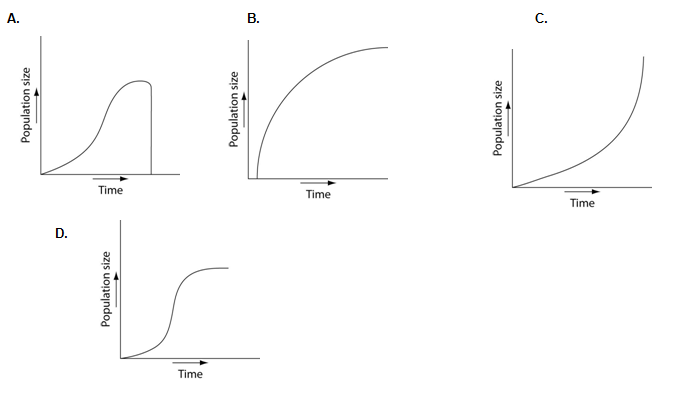
19. Why do populations grow more slowly as they approach their carrying capacity?

1. Density-dependent factors lead to fewer births and increased mortality.
2. Density-independent factors lead to fewer births and increased mortality.
3. Hormonal changes promote higher death rates in crowded populations.
4. Individuals voluntarily stop mating so that overcrowding does not occur.
5. The incoming energy decreases in populations experiencing a high rate of increase.

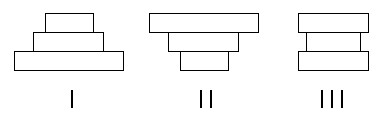
20. Which of the following graphs illustrates the population growth curve of single bacterium growing in a flask of ideal medium at optimum temperature over a 24-hour period?

21. Which of the following graphs illustrates the growth curve of a small population of rodents that has grown to reach a static carrying capacity?

22. Which of the following is a likely graphic outcome of a population of deer introduced to an island with adequate vegetation and without natural predators, parasites, or disease?



The following questions (23-24) refer to Figure 53.3, which depicts the age structure of three populations.



**Figure 53.3**

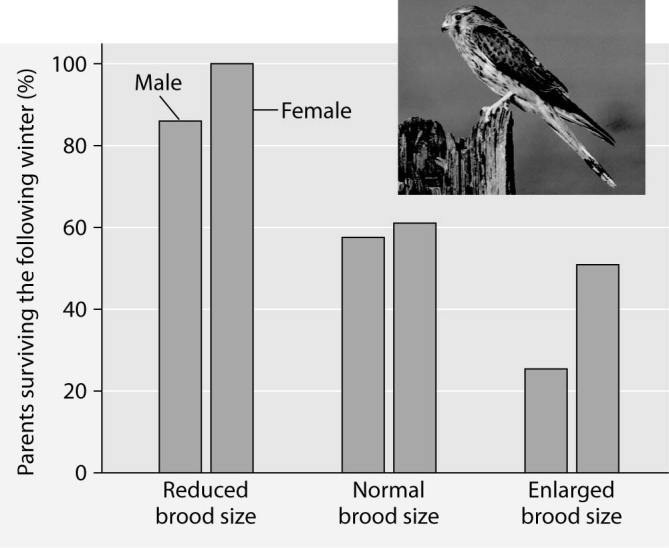
23. Which population(s) is (are) in the process of decreasing?

* 1. I
  2. II
  3. III
  4. I and II
  5. II and III

24. Assuming these age-structure diagrams describe human populations, in which population is unemployment likely to be a societal issue in the future?

* 1. I
  2. II
  3. III
  4. No differences in the magnitude of future unemployment would be expected among these populations.
  5. It is not possible to infer anything about future social conditions from age-structure diagrams.

Please read the paragraph below and review Figure 53.2 to answer the following question (25).



*Figure 53.2: Brood size manipulations in the kestrel: Effects on offspring and parent survival.*

Researchers in the Netherlands studied the effects of parental care given in European kestrels over five years. The researchers transferred chicks among nests to produce reduced broods (three or four chicks), normal broods (five or six chicks), and enlarged broods (seven or eight chicks). They then measured the percentage of male and female parent birds that survived the following winter. (Both males and females provide care for chicks.)

25. Which of the following is a conclusion that can be drawn from this graph?

* 1. Female survivability is more negatively affected by larger brood size than is male survivability.
  2. Male survivability decreased by 50% between reduced and enlarged brood treatments.
  3. Both males and females had increases in daily hunting with the enlarged brood size.
  4. There appears to be a negative correlation between brood enlargements and parental survival.
  5. Chicks in reduced brood treatment received more food, weight gain, and reduced mortality.